What can incoherent diffraction tell us about the nucleus?

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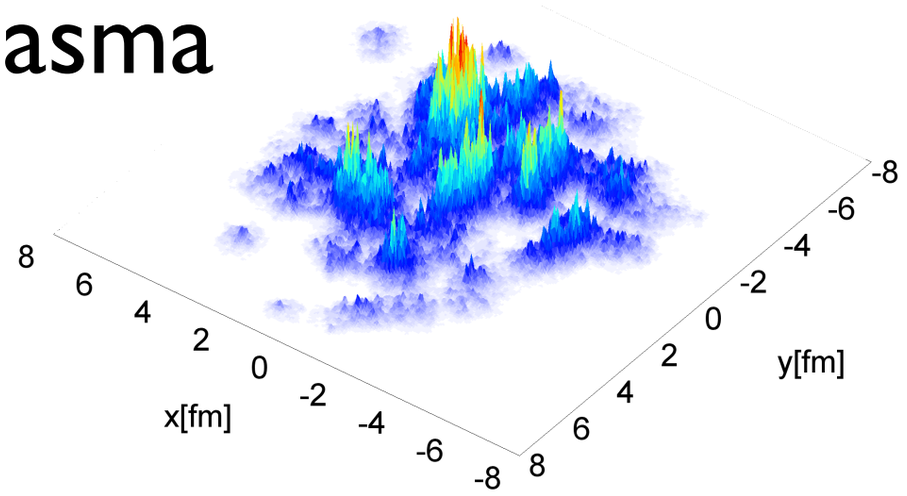
EIC Task Force Meeting

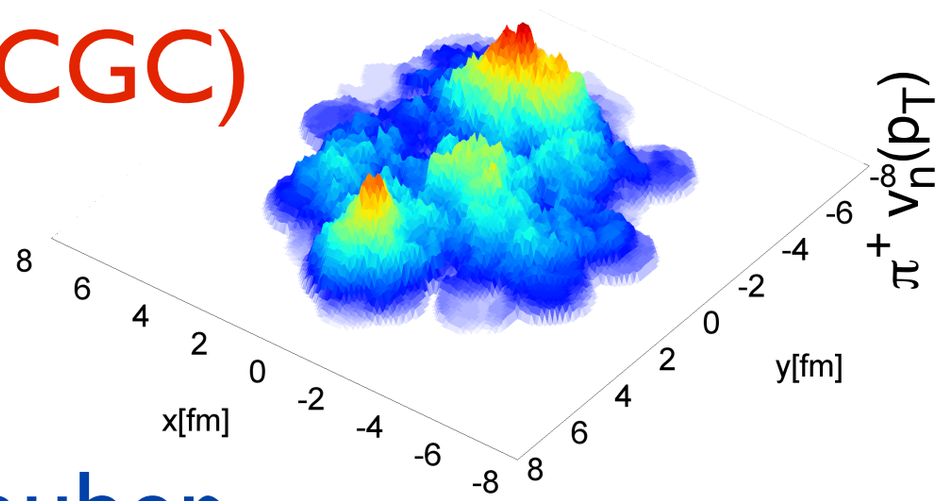
8 August 2013

A Reminder

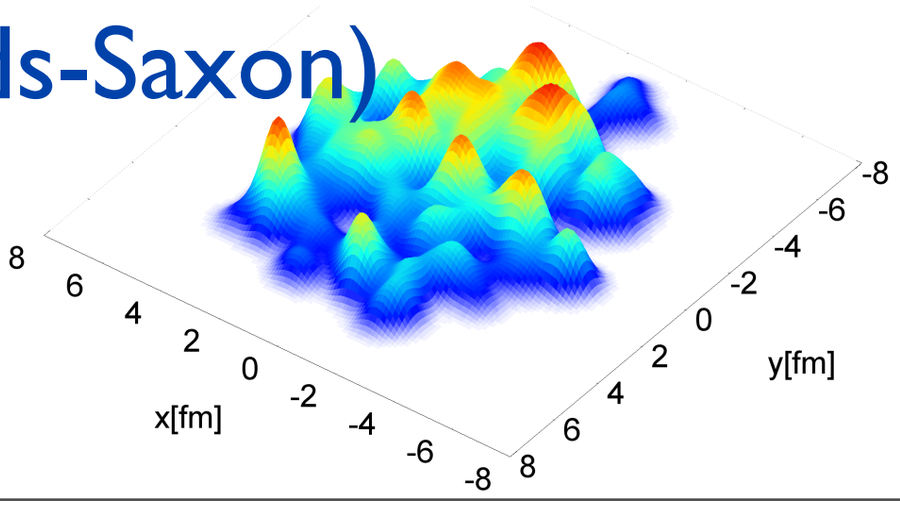
IP-Glasma

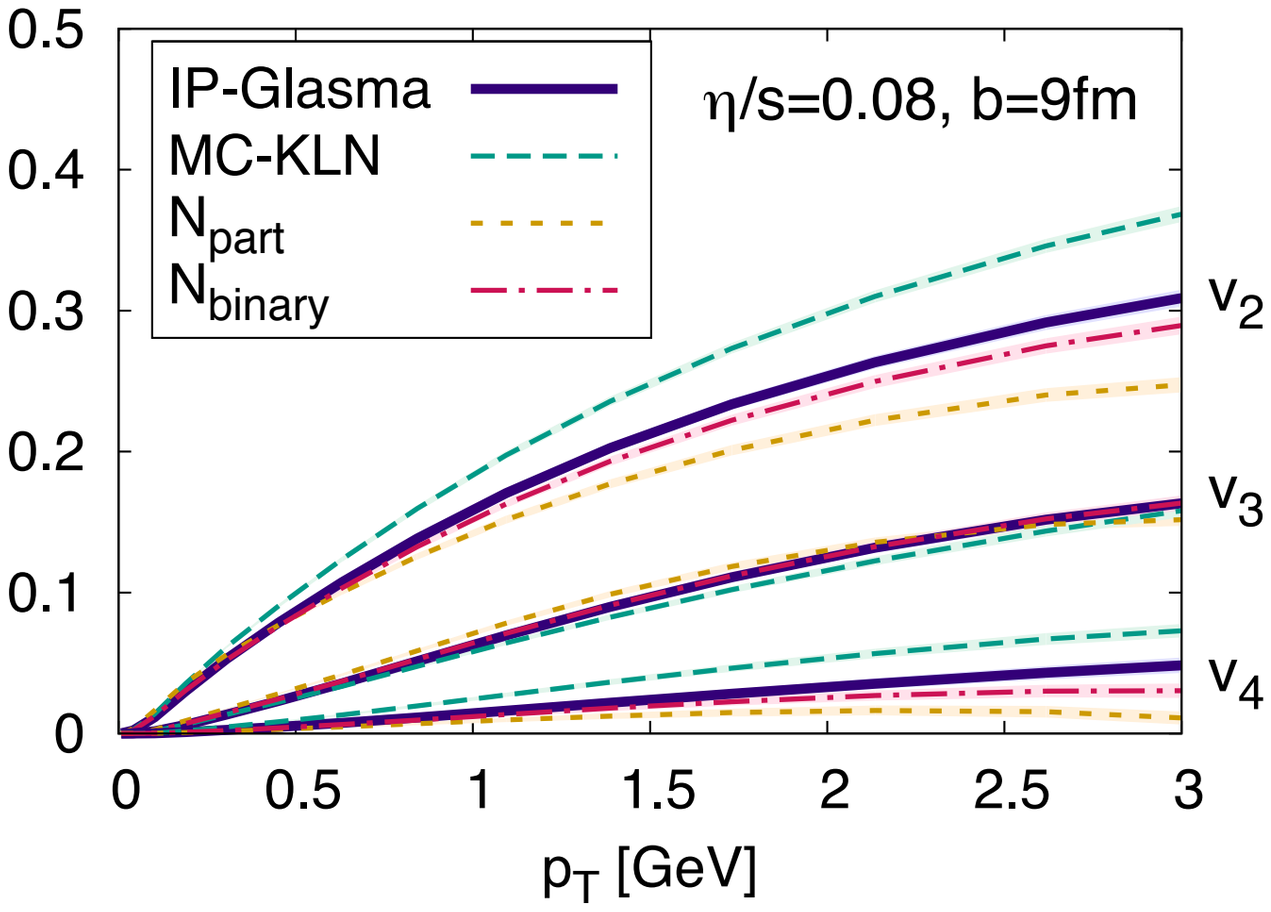


KLN(CGC)



Glauber (Woods-Saxon)





Incoherent diffraction

$$\frac{\mathrm{d}\sigma_{\mathrm{incoherent}}}{\mathrm{d}t} = \frac{1}{16\pi}\left(\left\langle \left|\mathcal{A}(x,Q^2,t,\Omega)\right|^2 \right\rangle_\Omega - \left|\left\langle \mathcal{A}(x,Q^2,t,\Omega)\right\rangle_\Omega\right|^2 \right)$$

Lumpiness comes from B_G

$$\sum_{i=1}^{A} T(|\mathbf{b}-\mathbf{b}_i|) \qquad T(b) = \frac{1}{2\pi B_G} e^{-\frac{b^2}{2B_G}}$$

If B_G is large, the nuclus becomes smoother.
In the limit, the incoherent =0.

Incoherent diffraction

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Lumpiness comes from B_G

This is an average for the proton!

$$\sum_{i=1}^{A} T(|\mathbf{b}-\mathbf{b}_i|)$$

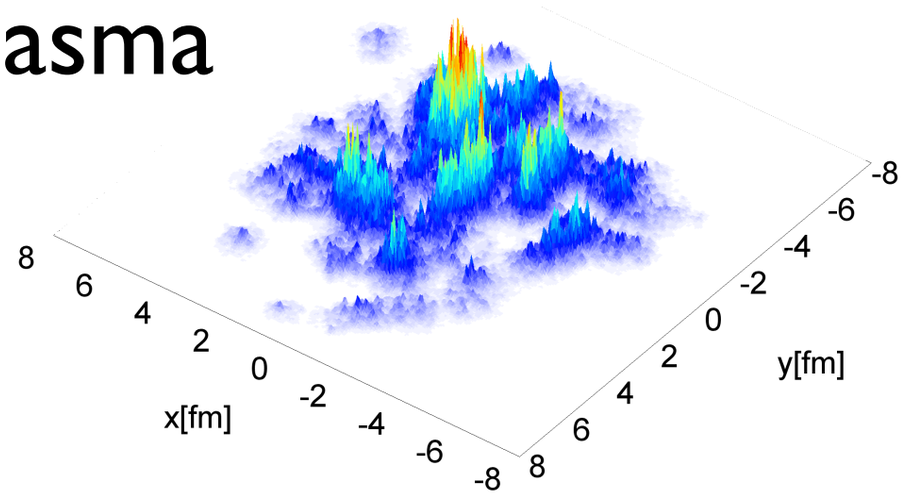
$$T(b) = \frac{1}{2\pi B_G} e^{-\frac{b^2}{2B_G}}$$

If B_G is large, the nuclus becomes smoother.

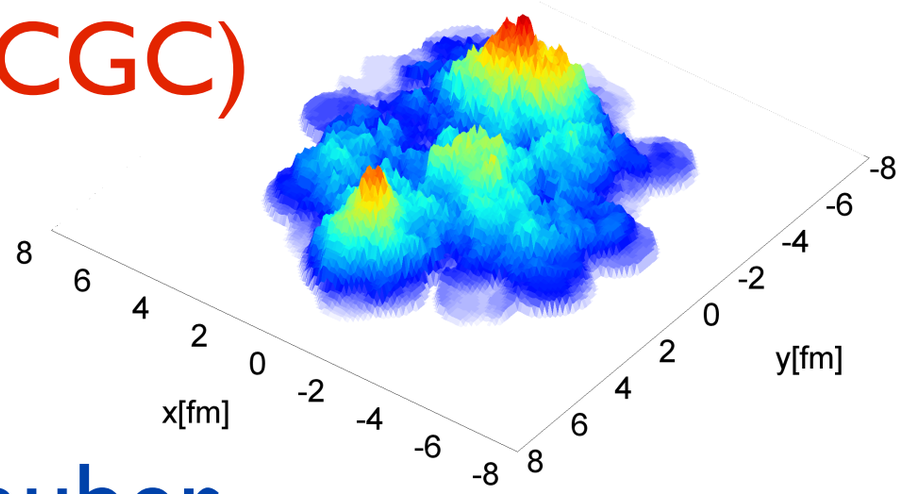
In the limit, the incoherent =0.

Using B_G to mock up g-correlations.

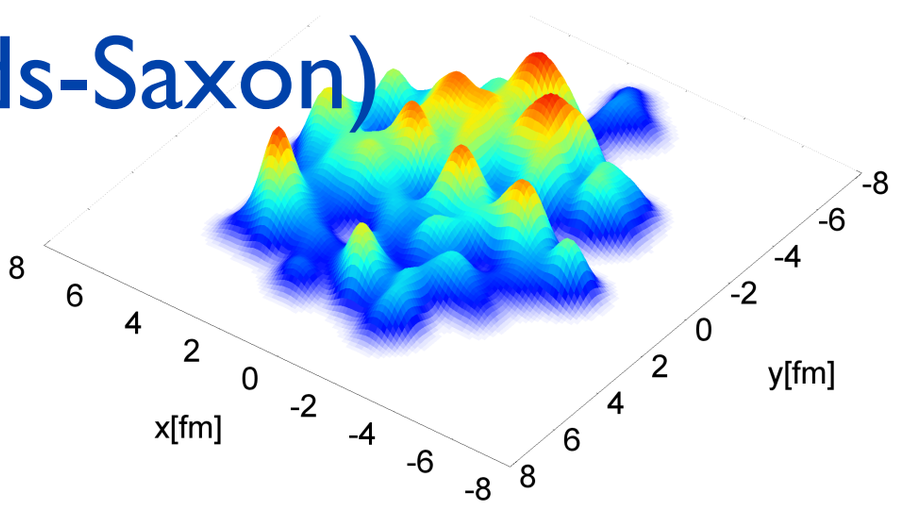
IP-Glasma

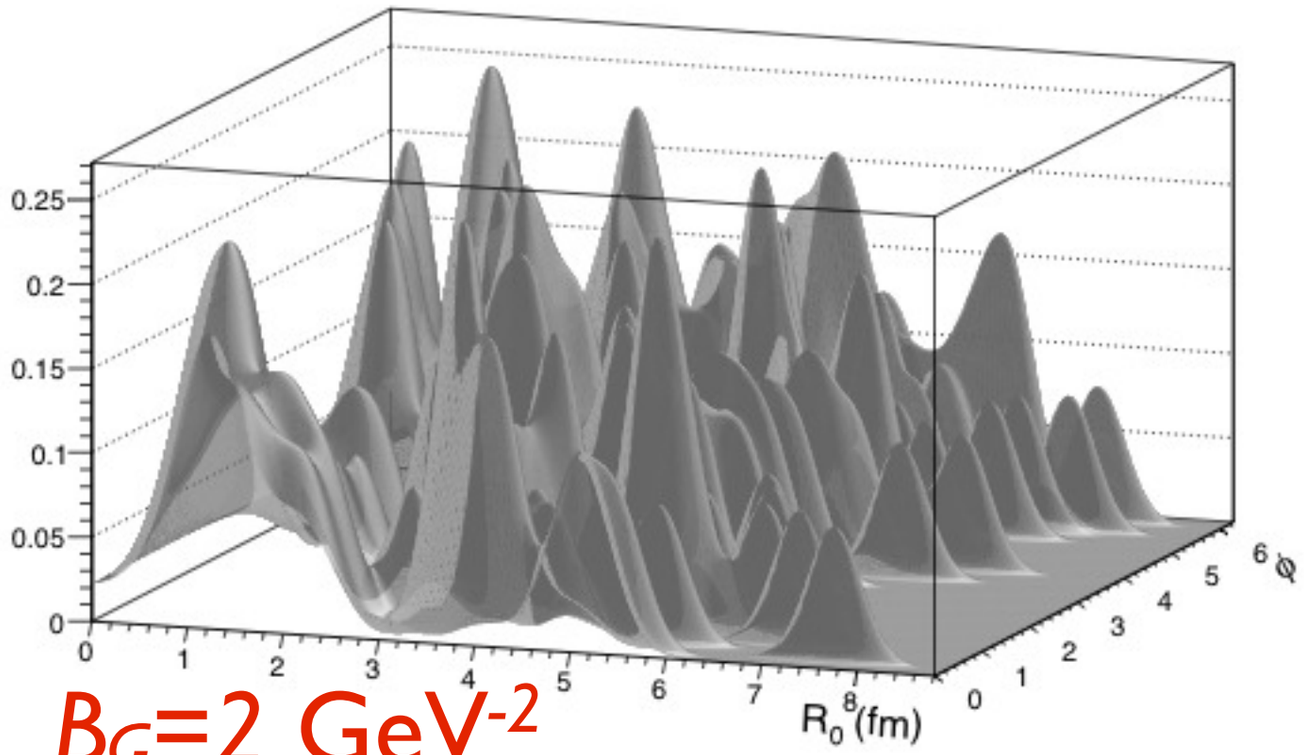


KLN(CGC)

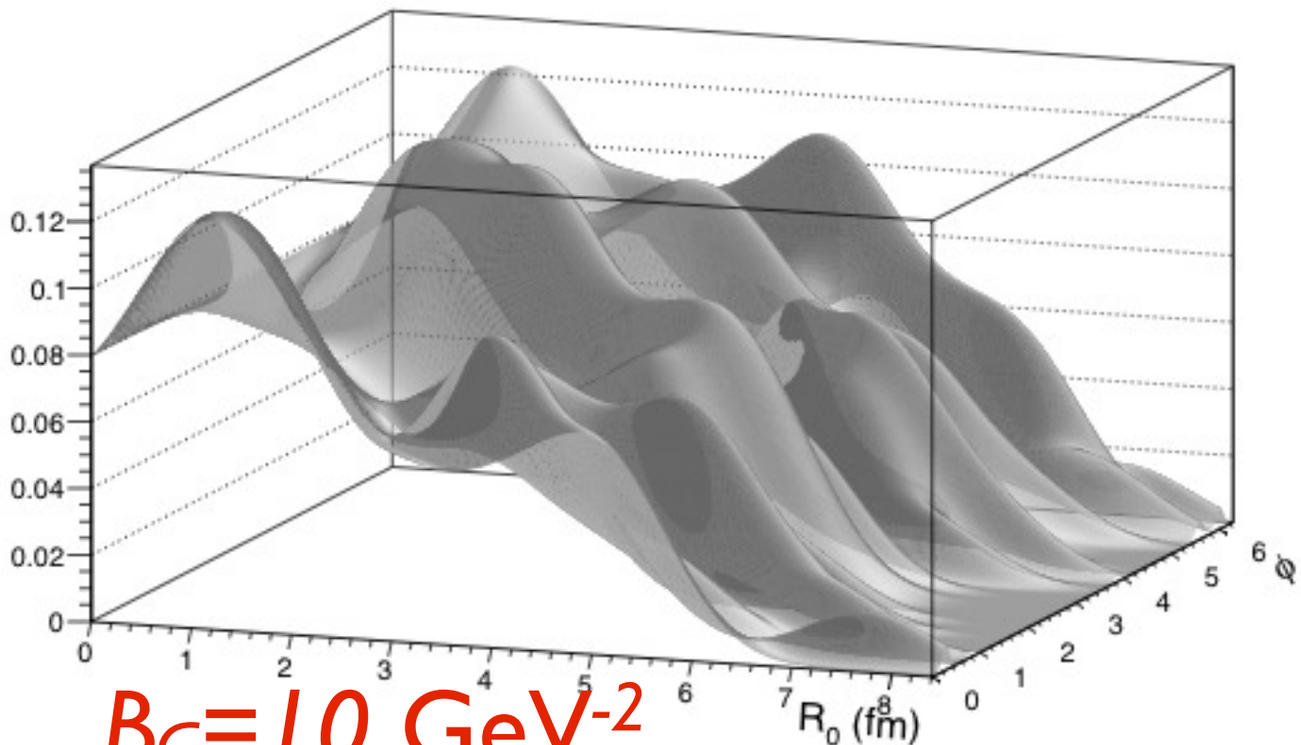


Glauber
(Woods-Saxon)



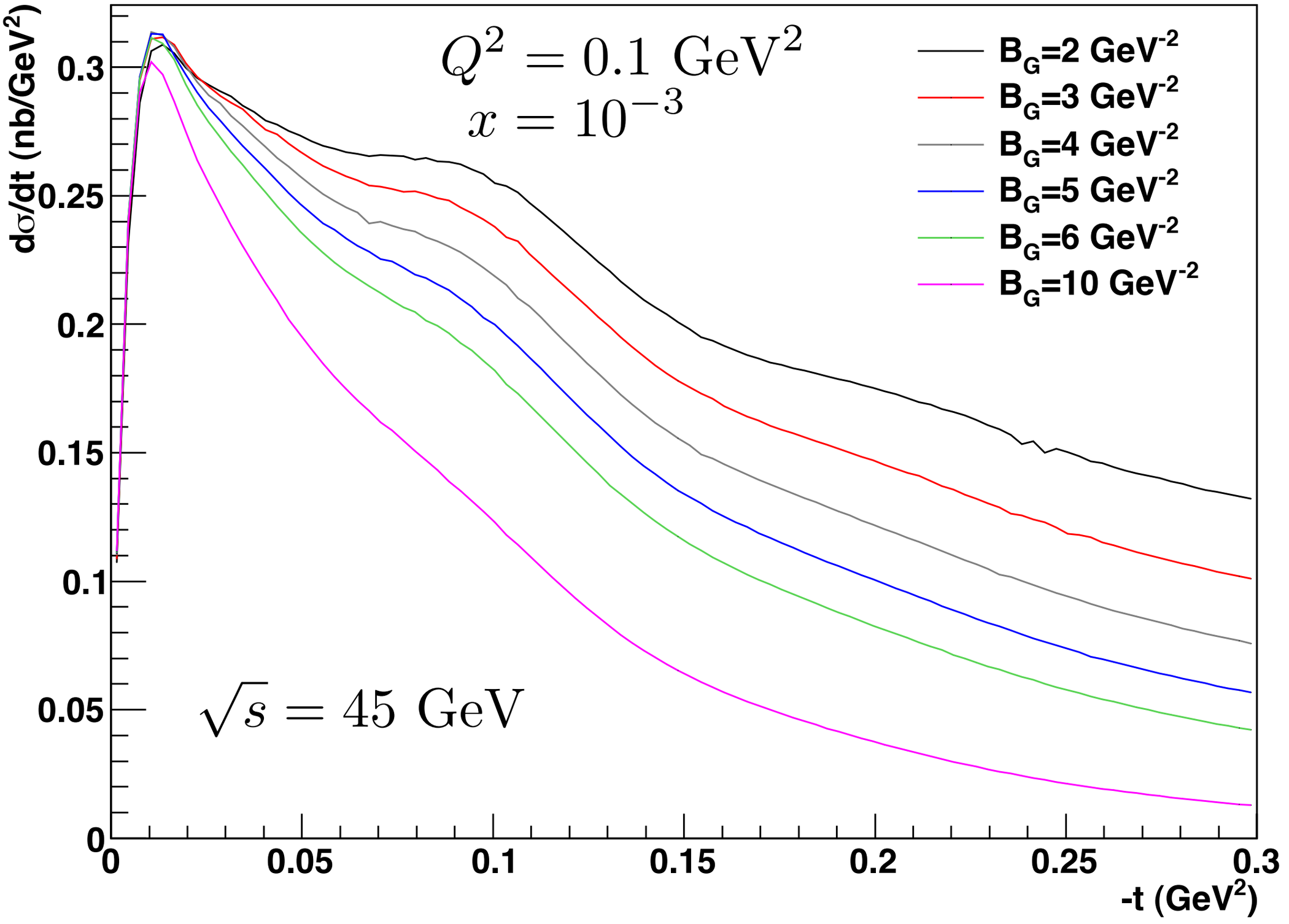


B_G=2 GeV^{-2}

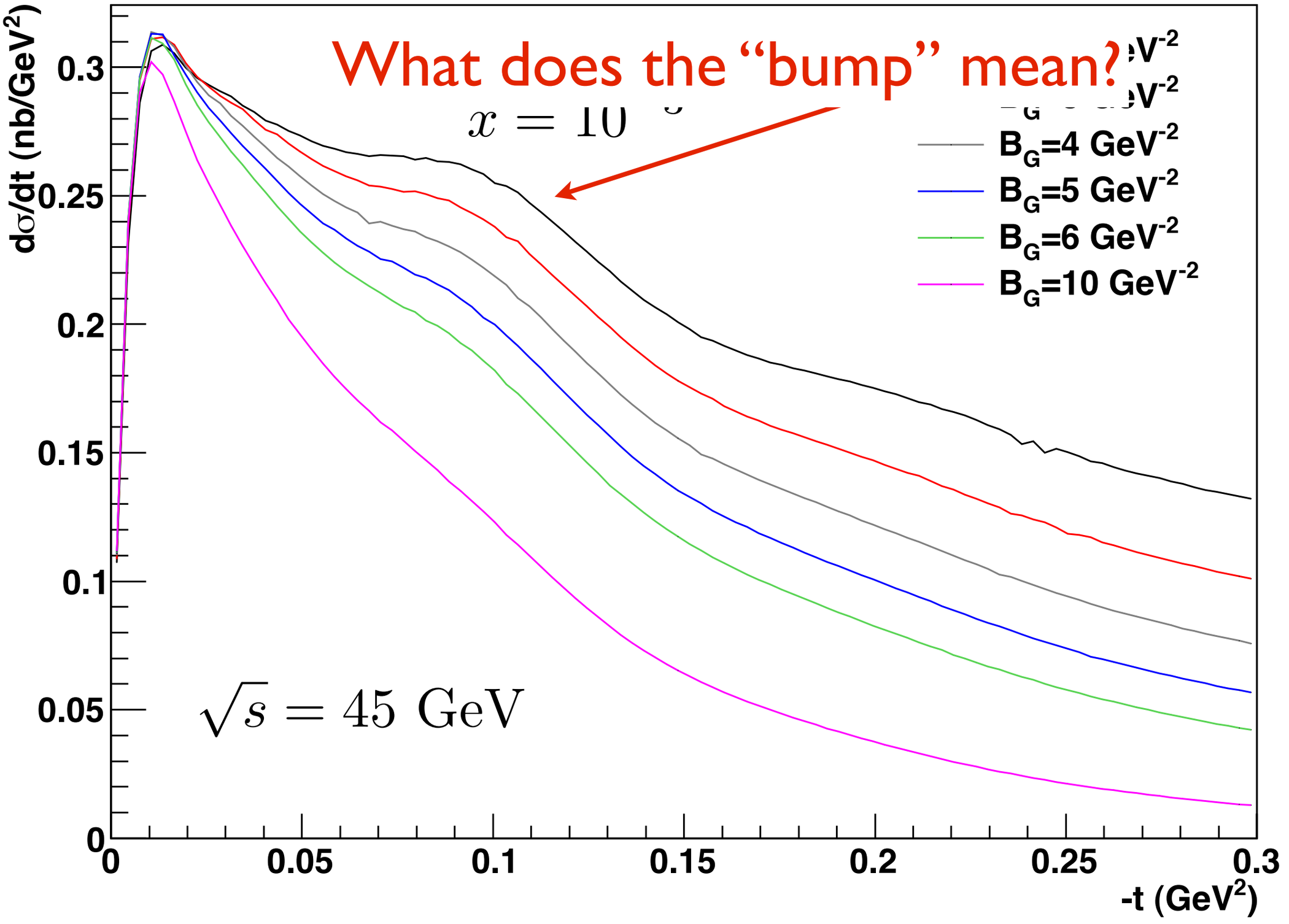


B_G=10 GeV^{-2}

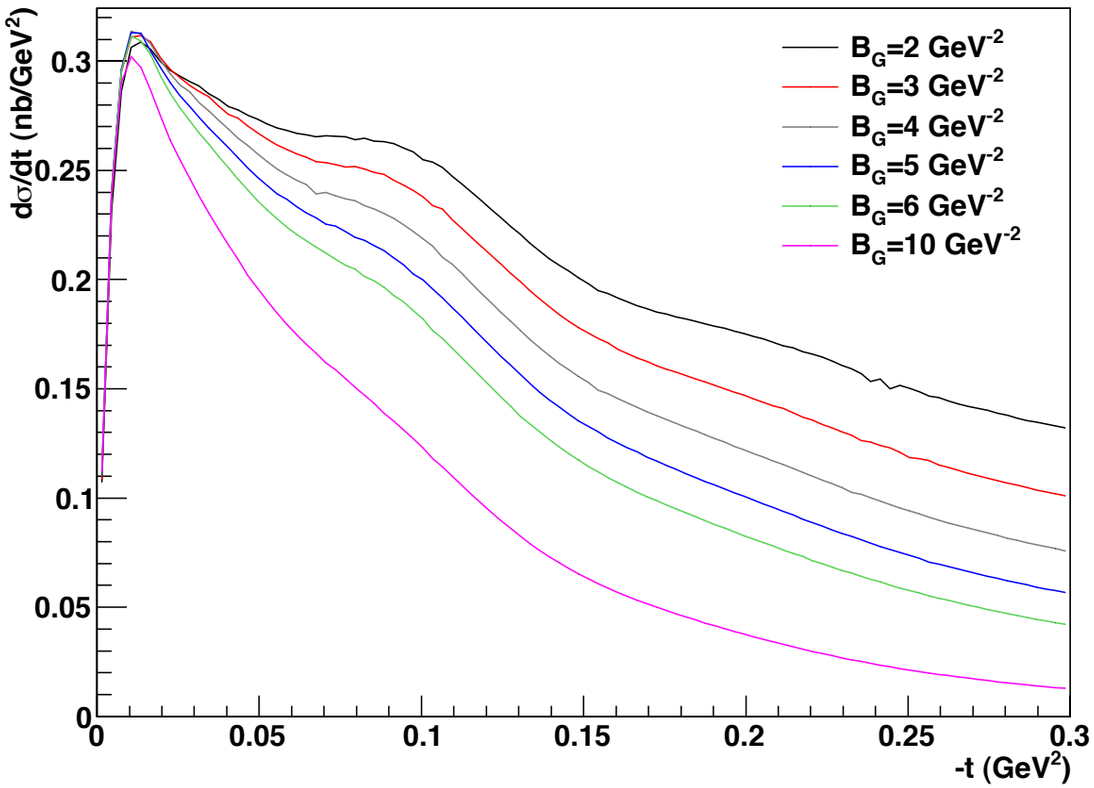
Results


$Q^2 = 0.1\ \mathrm{GeV}^2$
$x = 10^{-3}$
$\sqrt{s} = 45\ \mathrm{GeV}$
B_G=2 GeV^{-2}
B_G=3 GeV^{-2}
B_G=4 GeV^{-2}
B_G=5 GeV^{-2}
B_G=6 GeV^{-2}
B_G=10 GeV^{-2}
dσ/dt (nb/GeV^2)
-t (GeV^2)
0
0.05
0.1
0.15
0.2
0.25
0.3

Results


What does the "bump" mean?
$x = 10^{-3}$
$\sqrt{s} = 45$ GeV
B_G=4 GeV^{-2}
B_G=5 GeV^{-2}
B_G=6 GeV^{-2}
B_G=10 GeV^{-2}
dσ/dt (nb/GeV^2)
-t (GeV^2)
0
0.05
0.1
0.15
0.2
0.25
0.3

Discussion



It's believed that the correlation length of gluons in the nucleus should vary with Q^2 and x

We should be able to pick up these variations

Average over 500 configurations: plenty of hot-spots etc.

More?